

What is claimed is:

- 1 1. A storage device comprising:
2 a probe; and
3 a storage medium having a plurality of storage cells,
4 the probe to form a trench in regions of the storage medium corresponding to
5 at least two of the storage cells,
6 wherein the at least two storage cells contain corresponding portions of the
7 trench to store corresponding data bits.

- 1 2. The storage device of claim 2, wherein the storage medium comprises a
2 storage surface,
3 wherein a storage cell containing a transition between the storage surface and
4 the trench contains a data bit having a first state, and
5 wherein a storage cell containing either a portion of the trench or a portion of
6 the storage surface but not containing a transition between the storage surface and the trench
7 contains a data bit having a second state.

- 1 3. A storage device comprising:
2 a storage medium having a plurality of storage cells; and
3 a probe to read from and write to the storage cells,
4 wherein the storage medium includes a first structure and second structure,
5 wherein a first storage cell containing a transition between the first structure
6 and the second structure contains a data bit having a first state, and
7 wherein a second storage cell not including a transition between the first
8 structure and the second structure contains a data bit having a second state.

- 1 4. The storage device of claim 3, wherein the first structure comprises a trench,
2 and the second structure comprises a surface of the storage medium.

1 5. The storage device of claim 1, wherein the first structure has a different
2 physical characteristic than the second structure.

1 6. The storage device of claim 1, wherein the first structure has a different
2 chemical characteristic than the second structure.

1 7. The storage device of claim 1, wherein the first structure has a different
2 electronic characteristic than the second structure.

1 8. The storage device of claim 1, wherein the probe comprises a nanotechnology
2 probe.

1 9. A system comprising:
2 a processor; and
3 a storage device coupled to the processor, the storage device comprising:
4 a probe;
5 a storage medium having a storage surface,
6 the probe to form a trench in the storage medium,
7 wherein a transition between the trench and the storage surface
8 represents a first storage state, and wherein lack of a transition between the trench and the
9 storage surface represents a second different storage state.

1 10. The system of claim 9, wherein the storage medium includes storage cells, a
2 first storage cell being located in a first region containing a first end of the trench, and a
3 second storage cell is located in a second region containing a second end of the trench, each
4 of the first and second ends constituting a transition.

1 11. The system of claim 10, wherein a third storage cell is located in a third region
2 containing a portion of the trench, and a fourth storage cell is located in a fourth region
3 containing a portion of the storage surface of the storage medium away from the trench.

1 12. The system of claim 11, wherein each of the first and second storage cells
2 stores a respective data bit having the first storage state, and each of the third and fourth
3 storage cells stores a respective data bit having the second storage state.

1 13. The system of claim 9, further comprising read circuitry to detect engagement
2 of the probe with a transition between the trench and the storage surface.

1 14. The system of claim 13, wherein the probe has a tip, the probe tip and the
2 storage medium moveable with respect to each other to enable the probe tip to engage the
3 storage surface, the trench, and any transition between the trench and the storage surface.

1 15. The system of claim 14, wherein the probe tip is adapted to form the trench
2 during a write operation.

1 16. The system of claim 15, wherein the probe tip is adapted to form a second
2 trench in the storage medium during the write operation, a transition between the second
3 trench and the storage surface to represent the first storage state.

1 17. The system of claim 16, further comprising:
2 an encoder to encode input data to produce encoded data; and
3 write circuitry to cause the probe to write the encoded data to the storage
4 medium by forming at least the trenches in the storage medium.

1 18. The system of claim 17, wherein the encoding performed by the encoder
2 causes each of the trenches to have greater than a predetermined length.

1 19. A method of storing data in a storage device, comprising:
2 forming, with a probe, a first structure in a storage medium, the storage
3 medium further comprising a second structure;
4 indicating a first data state in response to detecting a transition between the
5 first structure and the second structure in a first storage cell; and

6 indicating a second data state in response to detecting lack of transition
7 between the first structure and the second structure in a second storage cell.

1 20. The method of claim 19, wherein the first structure comprises a trench, and the
2 second structure comprises a surface of the storage medium,
3 wherein forming the trench comprises heating a temperature of a tip of the
4 probe to greater than a write temperature to cause a portion of the storage medium to melt.

1 21. The method of claim 20, wherein detecting a transition comprises detecting a
2 transition between the trench and the surface of the storage medium.

1 22. The method of claim 20, further comprising:
2 receiving input write data;
3 encoding the input write data to produce encoded write data; and
4 writing the encoded write data to storage cells of the storage medium instead
5 of the input write data,
6 wherein writing the encoded write data to the storage cells comprises writing
7 variable length trenches in the storage medium.

1 23. A storage device comprising:
2 a probe;
3 a storage medium having a plurality of storage cells,
4 the probe to form plural variable-length trenches in the storage medium to
5 store data in the storage cells.

1 24. The storage device of claim 23, wherein the plural trenches comprise a first
2 trench and a second trench, the first trench having a first length, and the second trench having
3 a second, different length,
4 wherein the first trench extends through a first number of storage cells, and
5 wherein the second trench extends through a second, different number of storage cells.